

Appendix F-1

PERSONNEL MONITORING

I. PERSONNEL MONITORING

Individuals serving as Radiographers and Radiographer's Assistants are required to wear a combination of Personnel Monitoring Devices, including

- A Direct Reading Pocket Dosimeter, and
- An operable Alarm Ratemeter, and
- A Personnel Monitoring Badge, either a film badge, thermoluminescent dosimeter (TLD), or an Optically Stimulated Luminescent Dosimeter (OSLD).

These devices must be worn on the front of the torso at, or above the waist and below the shoulder, at all times during radiographic operations. **Radiography shall not be performed if one of the required dosimeters is missing or is inoperable.**

Complete Form F, Personnel Monitoring Program, describing the proposed radiation dose monitoring program and submit the completed form with the application.

II. DESCRIPTION OF PERSONNEL MONITORING DEVICES

A. Personnel Monitoring Badges

1. General

Personnel monitoring badges must detect beta, gamma and neutron radiation, therefore, the capabilities of available badges must be verified before making a selection. Dosimetry processors must hold accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology. A list of NVLAP accredited dosimetry vendors is available on the Internet at www.nist.gov.

Each order of badges includes a control badge for measuring the amount of background radiation the badges receive each monitoring period. This enables the background to be subtracted from the total reading to provide an accurate record of each individual's occupational radiation dose. When not in use the badges should be stored with the control badge to ensure accurate dosimetry records. The control badge must be stored in a low background radiation location and must be returned with the other badges each monitoring period.

2. Film Badges

Film badges are small pieces of x-ray film contained in a plastic holder. The film darkens in proportion to the amount of radiation it has been exposed to, so measurements of the film density provide a measurement of the wearer's radiation dose. Film badges should be protected from extreme environmental conditions which may affect their ability to accurately record radiation. Film badges must be exchanged on a MONTHLY basis.

3. Thermoluminescent Dosimeters (TLD)

TLDs are personnel monitoring badges that contain small crystals capable of storing some of the energy from radiation. If the crystals are then heated to a specific temperature, they release the stored energy as light. The amount of light released is proportional to the amount of radiation the TLD badge received, which can be measured to determine the wearer's dose. TLDs should be protected from extreme environmental conditions which may affect their ability to accurately record radiation. They must be exchanged on a MONTHLY basis.

4. Optically Stimulated Luminescent Dosimeters (OSLDs)

OSLDs measure radiation through a thin layer of aluminum oxide. A laser light stimulates the aluminum oxide after use, causing it to become luminescent in proportion to the amount of radiation exposure. OSLDs must be exchanged on a MONTHLY basis.

B. Personnel Monitoring Direct Reading Devices

1. Direct Reading Pocket Dosimeters

Pocket Dosimeters provide an immediate measurement of the total radiation dose the wearer received in the time period while wearing the dosimeter. Pocket dosimeters shall have a range of 0 to at least 200 millirem. The dosimeters must be recharged at least daily or at the beginning of the shift. If an individual's pocket dosimeter discharges beyond its range (off-scale), the individual shall STOP all radiographic operations and the individual's film badge, TLD, or OSLD shall be collected and processed immediately. The individual shall not resume radiography until a final determination of the radiation exposure has been determined. Pocket dosimeters shall be checked for correct response to radiation at periods not to exceed one year. Acceptable dosimeters shall be read within plus or minus twenty percent of the true radiation dose. NOTE: Electronic personal dosimeters may only be used in place of ion chamber pocket dosimeters.

2. Alarm Ratemeters

An Alarm Ratemeter detects and measures the radiation dose rate and alarms at a preselected alarm setpoint. Each Alarm Ratemeter shall

- a. Be checked to ensure the alarm functions properly before using (at the start of each shift)
- b. Be set to alarm at a preset dose rate of 500 millirem per hour, with an accuracy rate of plus or minus 20 percent of the true dose rate
- c. Require special means to change the preset alarm function, and
- d. Be calibrated at periods not to exceed 12 months for correct response to radiation.

III. INSTRUCTIONS FOR USING PERSONNEL MONITORING DEVICES

A. General Instructions

Personnel Monitoring Devices, as described in Paragraph I, above, shall be worn at all times when handling, using, or transporting a radiographic device. Radiographic personnel will be assigned a Personnel Monitoring Badge which can only be worn by the individual to whom it has been assigned. Badges must be promptly returned to the Radiation Safety Officer (RSO) at the end of each monitoring period to ensure rapid processing.

All Personnel Monitoring Devices shall be worn on the front of the torso, at or above the waist and below the shoulder.

Recommended Work Practices for Personnel Monitoring

- ◆ Never leave Personnel Monitoring Devices in close proximity to a radiographic device or other radiation source
- ◆ Protect Personnel Monitoring Badge from moisture, intense heat or light and chemicals
- ◆ When not in use, store Personnel Monitoring Badge with their control badge in a low background radiation area

B. Special Instructions for New Hires and Lost/Damaged Dosimeters

To ensure accurate monitoring of occupational dose, an assigned personnel monitoring badge will be ordered immediately for new radiographic personnel. A spare/visitor badge may be provided to new workers until the assigned dosimeter arrives.

If a Personnel Monitoring Device is lost or damaged the individual shall cease work immediately until a replacement device is provided and the dose is determined for the

time period from issuance to loss or damage of the dosimeter. The Radiation Safety Officer must request approval from the Department to revise the individual's dosimetry record.

Spare Personnel Monitoring Badges may be used to replace a Personnel Monitoring Badge that has been lost or damaged before the end of the monitoring period, provided the spare badge is imprinted with the individual's name or another form of identification. Radiographic personnel assigned a spare badge will have the dose recorded by the dosimeter added to their occupational dose record.

IV. PERSONNEL MONITORING RECORDS REQUIREMENTS

A. Records of Prior Occupational Dose

Prior to assigning a dosimeter to radiographic personnel the individual's occupational radiation dose received during the current year will be determined. In addition, every reasonable effort must be made to obtain the individual's records indicating the individual's cumulative occupational radiation dose. If an individual is unable to provide the information, records from their previous employer will be obtained. Prior occupational dose records shall include all of the information required by the Rules and Regulations for Control of sources of Ionizing Radiation, Paragraph RH-2826, "Cumulative Occupational Exposure History", Department Form Z, or an equivalent form.

B. Records of Individual Monitoring Results

Records of doses received by each monitored individual will be maintained as long as the company's license remains in effect. Dosimetry records will be kept in accordance with the Rules and Regulations for Control of Sources of Ionizing Radiation, Paragraph RH-2804, "Notifications and Reports to Individuals" on Department Form Y, "Occupational Exposure Record for a Monitoring Period", Paragraph RH-2825, or an equivalent form, and will contain all of the information required by Paragraph RH-2804. These records will be updated annually.

C. Annual Reports to Monitored Individuals

Radiographic personnel assigned a Personnel Monitoring Badge will receive a written annual dose report describing the past year's monitoring results, as required by the Rules and Regulations for Control of sources of Ionizing Radiation, Paragraph RH-2804, "Notifications and Reports to Individuals". Records documenting that the reports have been furnished to monitored workers will be maintained for at least 3 years.

D. Termination Reports to Monitored Individuals

Within 30 days of termination of employment, or within 30 days after the individual's exposure has been determined, whichever is later, each monitored individual will receive a written report summarizing the individual's occupational radiation dose, as required by Rules and Regulations for Control of sources of Ionizing Radiation, Paragraph RH-2804, "Notifications and Reports to Individuals". Records

documenting that the reports have been furnished to monitored workers will be maintained for at least 3 years.

E. Records for Declared Pregnancies

The fetal dose will be closely monitored so as not to exceed 500 millirem. Female radiographic personnel that have declared themselves pregnant will be instructed to always wear their assigned dosimeters at waist level to estimate the embryo/fetus dose. Recordkeeping requirements specified in the Rules and Regulations for Control of sources of Ionizing Radiation, Paragraph RH-1207, "Dose to an Embryo/Fetus" and RH-1500.f.5., "Records of Individual Monitoring Results", will be met.

F. Occupational Dose Limits for Minors

Minors will not exceed an annual occupational dose of 500 millirem. Recordkeeping requirements specified in Rules and Regulations for Control of sources of Ionizing Radiation, Paragraph RH-1206, "Occupational Dose Limits for Minors" and Paragraph RH-2804, "Notifications and Reports to Individuals", will be met.

G. Worker Overexposure Reports

When a report of an individual's exposure is sent to the Department as required by Rules and Regulations for Control of sources of Ionizing Radiation, Paragraph RH-1505, "Notifications and Reports to Individuals", the exposed individual will also be notified no later than when the report is sent out.

Appendix F-1

Form F-1

PERSONNEL MONITORING PROGRAM

Describe the proposed personnel radiation dose monitoring program by marking the appropriate boxes. Submit the completed Form with the Application

1. Personnel Monitoring Badge Service---Vendor Supplied

a. Type Badge to be Used:

☐ **Film** ☐ **OSLD** ☐ **TLD**

b. Radiation Detected:

☐ **Beta** ☐ **Gamma** ☐ **Neutron**

c. Type Monitoring:

☐ **Whole body** ☐ **Extremity**

d. Frequency of exchange:

☐ **Monthly**

e. Supplier of Personnel Monitoring Badge Service:_____

Vendor Registration Number:_____

2. Pocket Dosimeter or Electronic Personal Dosimeter

Manufacturer :_____

Model Number:_____

3. Alarming Ratemeter

Manufacturer :_____

Model Number:_____